EPA comments on the Background Investigation Sampling and Analysis Plan
Columbia Falls Aluminum Company Superfund Site, Columbia Falls, Montana
Prepared for Columbia Falls Aluminum Company, LLC
Prepared by Roux Environmental Engineering and Geology, D.P.C.
Dated May 25, 2018

Responses Prepared for Columbia Falls Aluminum Company, LLC prepared by Roux
Dated July 9, 2018
Roux responses in blue

<u>General Response</u>

On behalf of CFAC, Roux submitted Phase II SAP Record of Modification #2 to EPA on June 18, 2018. Modification #2 discussed the results of dioxin and furan sampling at the Site, and proposed adding dioxins and furans to the proposed soil background areas. EPA provided comments on Modification #2 on June 15, 2018 and recommended the additional dioxin and furan sampling scope be added to the revised Background Investigation SAP since it is not yet finalized. As such, references to dioxins and furans are included in this response to comments where applicable. The Background Investigation SAP will be revised to incorporate the analysis of background soil samples for dioxins and furans.

<u>General Comments</u>

There is a mixture of use of the terms “background” and “reference”. According to the introduction, the term “background” should be used throughout.

The text will be revised to replace the term “reference” with “background” where applicable. The term “reference” will be utilized when discussing the offsite background reference areas.

The data quality objectives (DQOs) do not provide the requisite information to support the selected study design. Please add additional detail to each step of the DQOs to provide adequate detail on the required objectives and outputs for each step of the DQO process. Refer to the EPA DQO guidance, *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4)*, and the specific comments below.

The Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4) was used during the development of the DQOs. Additional information will be provided to support the design study, and in some locations, requisite information will be relocated to appropriate sections as noted in the comments provided below. It should be noted that the DQO development and their respective report sections is referenced throughout the document.

<u>Specific Comments</u>

Title Page and Section 1 – Revise the name of the site to be “Columbia Falls Aluminum Company Superfund Site”.

The name of the Site on the title page and Section 1 will be revised as requested.

Page 2, Section 2.1, 2nd paragraph – The first sentence indicates cyanide, fluoride, and polycyclic aromatic hydrocarbons (PAHs) are the primary chemicals of potential concern (COPCs) [emphasis added]. This suggests there are "secondary" COPCs that have not been included in this list. Given that metals are identified for collection as part of the background investigation, it is presumed these analytes are also COPCs. Please revise this paragraph to include the full list of COPCs.

Section 2.1 will be revised to remove the word "primary." Additionally, the paragraph will be revised to reference the addition of dioxins and furans to the Background Investigation. The paragraph will be revised to state the following:

Results of the Phase I Site Characterization indicated that cyanide, fluoride, polycyclic aromatic hydrocarbons (PAHs), metals, dioxins and furans are COPCs found within the Site. Cyanide, fluoride, and PAHs were identified as Site-related COPCs in the Phase I based upon knowledge of historical Site operations and the distribution of concentrations observed in the various media around source areas and Site features. Metals were also frequently detected across the Site in most soil, surface water, and sediment samples and identified as COPCs. Additionally, dioxins and furans were detected in soil within the Rectifier Yards.

Although cyanide, fluoride, PAHs, some metals, and dioxins/furans were determined to be COPCs, these constituents may also be present within the background environment.

Page 2, Section 2.1, 2nd paragraph – It is not anticipated cyanide would be present in a background environment. Please revise the statement to reflect this condition and state which COPCs are anticipated in a background environment and why (i.e., due to either natural processes or anthropogenic impacts).

Section 2.1 states that cyanide *may* be present within the background environment.

Cyanide, fluoride and PAHs can be found as naturally occurring substances within the environment; however, as specified in the conceptual site model, these constituents are COPCs at the Site based upon knowledge of historical Site operations and the results of prior investigations. This presumption has been further confirmed based upon the concentrations of these COPCs detected in soil within Site features at various locations across the Site. However, cyanide, fluoride and PAHs will be evaluated to determine background concentrations of these COPCs which will allow for the proper framing of the risk assessment results.

With respect to metals and dioxins/furans, Montana Department of Environmental Quality conducted state-wide studies to determine at what concentrations each of these COPCs were occurring at background concentrations throughout Montana. During the preparation of the Phase I Data Summary Report, CFAC/Roux compared the Phase I results to existing Montana surface soil metals data from the Montana Background Soils Investigation (MSBI), as reported in "Background Concentrations of Inorganic Constituents in Montana Surface Soils" (Hydrometrics, 2013). Based on the results of the Phase I, concentrations of some metals are consistent with regional estimates of background concentrations. The comparison of soil concentrations of metals selected as COPCs to the background concentrations indicated that several of the metals may be representative of the concentrations of naturally occurring metals in the regional environment. Metals may occur naturally in the environment, but can be related to anthropogenic sources including industrial processes, fertilizers, aerial deposition, and many other sources.

CFAC/Roux reviewed the Montana Dioxin Background Investigation Report (MDEQ, 2011) to gain insight on quantified regional estimates of background concentrations. The MDEQ study indicated that dioxins and furans were detected frequently throughout the state, and a comparison of the CFAC Site data collected inside and outside the Rectifier Yards to the Montana Background values revealed that the majority of CFAC samples contained dioxins and furans at concentrations less than the Montana Background upper tolerance limit (UTL) for rural and urban data. These data suggest that there could be a background contribution to dioxin and furan concentrations being detected at the Site. Dioxins and furans may occur naturally in the environment from forest fires, and is also an anthropogenic by-product of many industrial processes.

This information will be included in Section 2.1 of the SAP.

Page 3-4, Section 2.2 – The primary objective of this sampling effort is to make comparisons of site to background. In that regard, there is only one study question – Decision Question #2 – that is needed for this investigation. Please revise the DQOs accordingly.

The estimation statement was included since a goal of the Background Investigation is to ascertain UCL_{mean} and BTV values before a decision can be made, and also to better frame the results of the risk assessment. Estimating these values are included in the Exhibit A approach flow chart. Based on the need to estimate these values in order to proceed with the evaluation, the estimation statement has been retained.

Page 3, Section 2.2 – This section does not discuss the statistic of interest for performing comparisons to background – i.e., a mean or a high-end value within the distribution. Although the text mentions the use of 95% upper confidence limits on the mean (95UCLs) and use of hypothesis testing (which is typically comparing means/medians), there is also mention of the use of background threshold values (BTVs) (which are often based on the high end of the background distribution). Thus, the basis for decision-making is unclear. Please revise the section for clarity; see also the proposed evaluation approach presented in Exhibit A.

The statistic of interest discussion is included in Step 5: Develop the Analytical Approach (Section 2.5). Note that the revised SAP will also incorporate the Exhibit A flow chart referenced above with minor modifications (See below modified Exhibit A).

Step 5 states that for each COPC, the UCL_{mean} concentration of onsite samples for each exposure area will be compared to the UCL_{mean} concentration of the respective background samples. The UCLmean provides a conservative estimate of the central tendency of each dataset. If the Site UCL_{mean} concentration exceed the background UCL_{mean} concentration, then the COPC will be treated as potentially Site-related. Otherwise, if the Site UCL_{mean} concentration does not exceed the background UCL_{mean} concentration, the COPC will be treated as background-related.

For all COPCs determined to be potentially Site-related, one-sided two-sample hypothesis testing will be performed comparing background data to onsite data by exposure area. Where appropriate, background reference areas will be combined to increase the background sample size and, in turn, the power of the analysis if two-sided hypothesis testing shows the background reference areas to be equivalent and comparable with respect to that COPC.

Mirroring the Exhibit A flow chart, for each COPC determined by hypothesis testing to be potentially Site-related, onsite data from individual samples will be compared to the BTVs (which represent an upper bound statistic of the background dataset). The results of this comparison will identify specific locations within the Site that appear to be impacted.

Additional text will be added to Section 2.2 to clarify the statistic of interest and the basis for decision making.

Page 3, Section 2.2 – The text does not discuss the basis of the BTV. Although this value typically represents a high-end concentration, the statistical basis is not stated. For example, ProUCL provides a range of statistics that could be selected (e.g., the UTL95-95, USL, 95UPL). Please clarify the basis of the BTV statistic.

To control the false positive error rate (Type I Error Rate), the Upper Tolerance Limit (UTL) 95-95 will be utilized for the BTV. This value represents a 95% UCL of the 95th percentile of the background data distribution. In other words, 95% of all potential observations (current and future) from the background population will be encompassed by the UTL95-95 with a confident coefficient of 0.95. As per the ProUCL Technical Guidance dated May 30, 2016, the UTL95-95 is an appropriate BTV for comparison of numerous onsite values.

The basis of the BTV described above will be included in Section 2.2 of the text.

Page 4, Section 2.3 – Please review the EPA DQO Guidance for the requisite outputs for DQO Step 3. In particular, this section should discuss the necessary sampling and analysis methods for generating these background data. Also, it is premature to discuss sample size (belongs in Step 7), temporal variability (belongs in Step 4), or statistical evaluation approach (belongs in Step 5) at this step in the DQO process.

Additional information will be added to indicate that background sampling and analytical methods will need to be comparable to the sampling and analytical methods used for the Phase II sampling, and those methods are defined in Section 4.0.

Information regarding sample size, temporal variability, and the statistical approach will be moved into the appropriate DQO steps described in EPA's comment.

Page 4, Section 2.3 – Specify the collection of water quality (e.g., nutrients, TOC, TDS, etc.), surface discharge, and soil/sediment quality parameters (e.g., bulk density, moisture content) as information inputs and include the rationale for why these parameters are being collected. Additionally, please add discussion of the need for collecting both total recoverable and dissolved fraction metal concentration and hardness data for surface water.

DQO Sections 2.1 (Define the Problem) and 2.3 (Identify Information Inputs) discuss that the results of the Phase I Site Characterization indicated that cyanide, fluoride, and PAHs are COPCs found within the Site, and metals were detected frequently across the Site in most soil, surface water, and sediment samples. Developing an understanding of the occurrence and concentrations of these COPCs in background reference areas will be necessary to frame the results of the risk assessment with respect to these COPCs.

Although the results of the Phase I determined that that cyanide, fluoride, PAHs, and select metals were considered COPCs at the Site, background surface water samples will be analyzed for full suites of SVOCs and metals, as it is not yet known whether additional SVOCs or metals may be identified as COPCs within the Site as part of the Phase II. Section 4.4 (Laboratory Analytical Methods) describes that surface water samples will be analyzed for total target analyte list (TAL) metals via USEPA Methods 6020A / 7470A; and dissolved TAL metals via USEPA Methods 6020A / 7470A. Section 4.2.3 will be revised to reference the list of analytical parameters in Section 4.4.

In addition to the analysis of potential COPCs, additional general chemistry and fate and transport parameters (as listed in Section 4.4) as are also being collected. The rationale for the additional general chemistry and fate and transport parameters is provided below. DQO Section 2.3 will be revised provide the rationale for the additional parameters.

- Hardness - Chronic surface water quality criteria for many metals are based on exposure to the dissolved phase and are a function of surface water hardness (as mg/L CaCO3).

- Surface water biotic ligand model (BLM) parameters: Ancillary parameters to support the evaluation of the BLM for copper (temperature, pH, dissolved organic carbon [DOC], calcium, magnesium, sodium, potassium, sulfate, chloride, and alkalinity) were collected in the final round of four surface water sampling events conducted as part of the Phase I Site Characterization. Exposure characterization for copper in surface water in the BERA will include analyses of the necessary ancillary parameters to support the evaluation of the BLM.

- COPEC bioavailability: Analytical parameters for surface water include total recoverable (unfiltered) and recoverable results to evaluate COPEC bioavailability.

- Organic carbon content: Influences the partitioning and bioavailability of metals and organic COPECs in soil and sediment.

- Fate and transport analytes including grain size distribution (sieve and hydrometer), moisture content, total organic carbon, and bulk density, will be analyzed on sediment samples to support future fate and transport assessment and modeling efforts, if necessary as part of the RI/FS.

Page 4, Section 2.3 – Provide justification provided for the sample size of 10. This discussion should be included in Step 7 of the DQO process. In particular, this discussion should demonstrate that 10 samples will be adequate to meet the stated tolerable decision error limits specified in Step 6 of the DQO process.

The sample size was determined in accordance with the USEPA Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, 2002) for one-sided two-sample hypothesis tests with confidence level 90% (α = 0.10). The power of the test was selected to be 90% (β = 0.10) at the relative difference of 1.5. The relative difference is the ratio of the minimum detectable difference (MDD) to the natural variability (standard deviation, σ). The value of 1.5 falls within the USEPA-recommended range of 1 to 3 (USEPA, 2002), and yields an approximate minimum sample size of seven (7) samples using the ProUCL DQOs Based Sample Sizes tool. This value was rounded up to ten (10) samples to be conservative and to ensure sufficient data are available to calculate reasonably reliable estimates of BTVs and UCL_{mean} concentrations. A minimum sample size of ten corresponds to a relative difference less than 1.2 as determined by the ProUCL tool.

Based on the existing Phase I surface soil dataset, a coefficient of variation ranging from 10% to 120% is expected. The coefficient of variation is different for each COPC, but on average was found to be

45%. These estimates are expected to be the upper bounds of the coefficients of variation since the background reference areas should have COPC concentrations less than or equal to the locations sampled during the Phase I

Where appropriate, background reference areas will be combined to increase the background sample size and, in turn, the power of the analysis if two-sided hypothesis testing shows them to be equivalent and comparable with respect to that COPC. Point by point comparisons of Site data to the BTVs will then be conducted for all COPCs determined by hypothesis testing to be potentially Site-related. The results of this comparison will identify specific locations within the Site that appear to be impacted.

Based on the above described approach, CFAC/Roux believes the sample size is adequate for the proposed analyses. As per the risk assessment work plans, the background analysis will not be used to eliminate COPCs from the risk assessment, but rather to better frame the outcome of the risk assessment and assess whether and to what extent background conditions may be contributing to the overall risk at the Site.

This discussion will be added to Step 7 of the DQO process.

Page 4, Section 2.3 – The statement "The samples will be analyzed for cyanide, fluoride, semivolatile organics (SVOCs) (including PAHs), and metals… (as described in Section 4.1)" is not consistent with the list of analytes in Table 1 (e.g., total organic carbon [TOC] is missing). Please check the text and table for consistency.

The text will be revised to include the full list of analyses for soil, sediment, and surface water based on the list of analytes in Table 1.

Page 4, Section 2.4 – Please review the EPA DQO Guidance for the requisite outputs for DQO Step 4. In particular, this section should discuss the smallest units upon which decisions will be made (i.e., discuss how the site datasets and background datasets will be grouped for the purposes of making site vs. background comparisons). Please ensure this section includes a discussion of the different exposure area sizes relative to the receptor types of interest (e.g., the exposure area for human receptor populations will be different for wildlife with small home ranges).

Background datasets will be compared to corresponding Site data using the conceptual approach proposed in Exhibit A (see the response to comment for proposed modifications to Exhibit A). For sediment and surface water, background datasets collected from upstream areas of the Flathead River and Cedar Creek will be compared to downstream exposure areas within each respective waterbody.

Background datasets representative of the three primary soil types identified on site [Alluvial Deposits (Qal), Glacial and Fluvioglacial (Qgr), and Revett Formation (Yr); see Figure 3 of the SAP] will be compared to soil datasets from human health and ecological exposure areas with corresponding soil types. The spatial distribution of the three primary surficial soil types identified within the Site was compared to the spatial distribution of ecological and human health exposure areas presented in the Baseline Ecological Risk Assessment Work Plan (BERAWP) and Baseline Human Health Risk Assessment Work Plan (BHHRAWP), respectively (EHS Support, 2017 a,b) to identify appropriate comparisons of Site datasets to proposed background datasets. A summary of primary soil types identified within each ecological and human health exposure area (terrestrial and transitional ecological exposure areas) is provided below:

Exposure Areas	USGS Surficial Geology/Soil Types (Figure 3)		
	Alluvial Deposits (Qal)	Glacial and Fluvioglacial (Qgr)	Revett Formation (Yr)
Ecological Exposure Areas			
Main Plant Area		●	
North Percolation Pond Area		●	
Central Landfills Area		●	●
Industrial Landfill Area		●	
Eastern Undeveloped Area		●	●
North-Central Undeveloped Area		●	●
Western Undeveloped Area		●	
Flathead River Riparian Area	●		
South Percolation Pond	●		
Cedar Creek Reservoir Overflow		●	
Northern Surface Water Feature		●	
Human Health Exposure Areas			
Main Plant Area		●	
North Percolation Pond Area		●	
Central Landfills Area		●	●
Industrial Landfill Area		●	
Eastern Undeveloped Area		●	●
North-Central Undeveloped Area		●	●
Western Undeveloped Area		●	
South Percolation Pond Area	●		
Flathead River Area	●		
Backwater Seep Sampling Area	●		

Prior to comparisons with Site datasets, background datasets will be evaluated to assess potential differences in COPC concentrations between the three primary soil types. Background datasets from primary soil types with COPC concentrations that are not statistically different will be pooled to: 1) minimize the number of representative background statistics to compare with site exposure area datasets; and 2) to increase the power and confidence of hypothesis testing between exposure area and background datasets due to increased sample size.

Background comparisons to evaluate human health exposure will be based on comparisons of site data from within human health exposure areas to representative background concentrations from corresponding soils types. Comparisons of site exposure area datasets to corresponding background datasets will be conducted using the general approach presented in Exhibit A (see the response to comment for proposed modifications to Exhibit A).

Background comparisons to evaluate ecological exposure will be based on the potential use of exposure areas by ecological receptors. The evaluation of exposure to large home range wildlife that may forage randomly across entire ecological exposure areas will be based on comparisons of site exposure area datasets to background datasets using the general approach presented in Exhibit A (see the response to comment for proposed modifications to Exhibit A). Potential exposure to small home range receptors will be evaluated within each exposure area based on comparison of the maximum COPC EPC within an exposure area to the BTV estimated from the corresponding background dataset, consistent with comparisons to risk-based soil benchmarks presented in the BERAWP (Section 5.2.1). If the maximum EPC within an exposure area exceeds the corresponding BTV, point-by-point comparisons of EPCs to the BTVs will be conducted to identify areas where small home range receptors may be exposed to COPC concentrations exceeding background concentrations. Sampling points exceeding the corresponding background BTV will be presented concurrently with sampling points exceeding risk-based soil benchmarks for the protection of small ranging receptors (see Section 5.2.1 of the BERAWP). Given that the judgmental study design biases sampling to areas of known or suspected sources or pathways, the incorporation of maximum and point-by-point exposure scenarios will provide conservative estimates of potential exposures to small home range receptors that exceed background exposure.

Section 2.4 of the Background SAP will be updated with a discussion of how background soil dataset comparisons were conducted with soil datasets from human health and ecological exposure areas.

Page 4, Section 2.4, 2nd paragraph – State the cardinal direction of the prevailing winds and provide a windrose diagram as a figure in this document.

The cardinal direction of the prevailing winds is south/southeasterly. A windrose diagram generated from Midwestern Regional Climate Center for Kalispell/Glacier Park Airport (Mean Wind Direction, 1948 – 2018) is provided as Figure 7. The text will be revised to include the cardinal direction of the prevailing winds, and a windrose diagram will be included as a figure in the revised report.

Page 4, Section 2.4, 2nd paragraph, last sentence – Typographical error: "32." should be "3.2".

The text will be revised as 3.2 rather than 32.

Page 4-5, Section 2.4 – Include a discussion of any expected patterns in concentration as a function of depth in the background areas. It is possible that background areas, even in upwind locations, have the potential to have Site-related and/or non-Site-related anthropogenic impacts due to aerial deposition. Additional discussion is needed to determine what, if any, sampling methodology adjustments may be needed to address this issue. **Recommend this as a topic for discussion on a future project call.**

Outside of the Site boundary, it is expected at COPC concentrations are highest at the surface and decrease with increasing depth. As stated in the previous responses, the cardinal direction of the prevailing winds is south/southeasterly. Generally, aerial deposition is the primary mechanism for contamination of soil within background areas impacted by anthropogenic sources; therefore, the Background Investigation is focused on sampling soils at the surface. The surface layer (0-6 in) would be the interval most likely impacted by the deposition of airborne pollutants, especially recently deposited pollutants and also pollutants that do not move downward because of attachment to soil particles.

Based on the results of the Phase I Site Characterization, Site boundary concentrations in the undeveloped areas for cyanide, fluoride, and PAHs were generally below the USEPA Protection of Groundwater RSLs or non-detect, and concentrations decreased with increasing depth suggesting that the highest concentrations are at the surface. Site boundary concentrations for metals, where detected, were detected at concentrations above USEPA Protection of Groundwater RSLs in the surface, shallow, and intermediate-depth soil samples.

Background concentrations will be compared to regional concentrations documented in the state of Montana studies to validate that concentrations observed are within ranges of regional estimates.

This discussion will be included in Section 2.4

Page 5, Section 2.4 – Based on a review of the surface soil types presented in Figure 4, there are more than three soil types within the Site boundary. Please clarify how and why soil types were combined into three general soil types. See also the comments on Figure 4 below.

As stated in Section 3.1, in general, three major surface soil types are present at the Site; Glacial Till and Alluvium, Fluvial Deposits and Riverwash, and Mountainous Land with Glacial Deposits. These three major soil types were generated based on review of the maps presents as Figures 3 and 4.

Figure 3 presents a geologic map of the Flathead Valley in the vicinity of the Site. As shown on this map, there are three primary soil types; glacial and fluvioglacial deposits (soils deposited by glacial activity) (Pleistocene) (Qgr); 2) alluvial deposits (soils deposited by river activity) (Holocene) (Qal); and 3) the Revett Formation (Middle Proterozoic) (Yr) which is expressed at the surface as Teakettle Mountain (soil interaction between the glacial outwash and bedrock).

Figure 4 presents the surface soil types within and surrounding the Site based on review of the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Service (https://websoilsurvey.nrcs.usda.gov). These soil types are more detailed than the generalized map presented on Figure 3, and can vary based on slight changes in grain size (for example, 27-7 and Mh). Although there are numerous surface soil types onsite based on the NRCS survey, these soil types can be grouped together into the three major soil types previously described due their similar geology.

The attached Tables 2 and 3 present soil code definitions included on Figures 3 and 4.

USGS Surface Soil Types (Figure 3)		NRCS Soil Types and Descriptions (Figure 4)				
General Soil Code	**Primary Soil Type**	**Detailed Soil Code**	**Description**	**Landform**	**Parent Material**	**Typical Profile**
Qgr	Glacial and Fluvoiglacial Deposits	27-7	Dystric Eutrochrepts, till substratum	Kames, kettles, terraces	Till	3 to 9 inches: very gravelly silt loam 9 to 18 inches: extremely cobbly sandy loam 18 to 31 inches: extremely cobbly sandy loam 31 to 60 inches: very cobbly loamy sand, very gravelly loamy sand, extremely gravelly sandy loam
Qgr	Glacial and Fluvoiglacial Deposits	Mh	Mires gravelly loam	Terraces, outwash fans	Outwash	0 to 8 inches: gravelly loam 8 to 18 inches: very gravelly loam 18 to 60 inches: very gravelly loamy sand
Qal	Alluvial Deposits	Rc	Riverwash	Flood plains	Flooded and ponded soils	Not available
Qal	Alluvial Deposits	16	Fluvents, alluvial fans	Alluvial fans	Alluvium	29 to 60 inches: extremely gravelly sand
Yr	Revett Formation (Teakettle Mountain)	Mr	Mountainous Land	Moraines	Glacial till	5 to 18 inches: loam 18 to 26 inches: gravelly silt loam 26 to 60 inches: gravelly loam
Yr	Revett Formation (Teakettle Mountain)	75	Rock outcrop, structural breaklands	Not available	Not available	100% bedrock

Pages 5 and 6, Section 2.5 – Use of statistical hypothesis testing requires the two datasets are collected using similar methodology (i.e., cannot compare discrete grabs to ISMs) and has limited utility for samples collected via judgmental sampling. There is also no discussion of the use of the BTV in decision-making. This section should be revised to clarify the proposed methodology for making site vs. background comparisons for each sample type. Refer to the flow diagram in Exhibit A to illustrate EPA's proposed methodology.

It is understood that the two datasets need to be collected using similar methodology. It should be noted that ISM sampling is not proposed for the background investigation, therefore samples previously collected using ISM will not be utilized in the hypothesis testing. If the hypothesis testing concludes a COPC is potentially Site-related, the BTV calculated from the background data for that COPC will be used for comparison of all onsite samples. The distribution of sampling locations will not be adversely affected by excluding the ISM samples from the hypothesis testing.

As stated in the Phase II SAP, although judgmental sampling designs have been used for both the Phase I and Phase II programs, random samples have been placed throughout the Site in each exposure area to obtain better spatial representativeness across each area, and to characterize COPC and COPEC concentrations near the Site boundary. Therefore, the background samples and the onsite samples are appropriate to compare.

Section 6.5 will be updated to reflect this response.

Page 5, Section 2.5, Estimation Statement – Outliers should not be eliminated solely on a statistical basis. There may be a location-specific reason for an outlier which will provide evidence for the anomalous value.

Outliers identified on a statistical basis will be evaluated to determine if there is a location specific reason which would provide evidence for the anomalous value. Section 2.5 will be updated to reflect this.

Page 5, Section 2.5, last paragraph – Averaging of field duplicates with parent samples is not ideal, especially for the purposes of performing hypothesis testing; please select highest result or use parent sample only.

Only the results of the parent sample will be used during the hypothesis testing. Section 2.5 will be updated to reflect this.

Page 6, Section 2.5, 2nd and 3rd paragraphs – Two-sample hypothesis testing should be performed using Background Test Form 2 (EPA 2002) – i.e., the null hypothesis should assume site is higher than background.

Background Test Form 2 will be utilized for these analyses. The null hypothesis and alternative hypothesis will be as follows:

> *The null hypothesis, H0*: The mean COPC concentration in samples from the exposure area is greater than the sum of the mean concentration in the respective background area and the substantial difference.
>
> *The alternative hypothesis, HA*: The mean COPC concentration in samples from the exposure area is less than or equal to the sum of the mean concentration in the respective background area and the substantial difference.

whereas the substantial difference, S, will be based upon a proportion of the mean background concentration or the background variability, or a selected percentile of the background distribution. Note that all three of these options are considered viable pursuant to the USEPA guidance. Roux is currently evaluating the dataset and will provide its preliminary recommended approach on the conference call scheduled for July 10th, 2018.

Page 6, Section 2.6.1, last paragraph – Clarify what is meant by an "inconclusive" hypothesis test. The selected sampling design should meet the stated objectives, including the stated tolerable limits for decision errors; thus, there should not be inconclusive hypothesis test results.

An "inconclusive" hypothesis test is one that falls within the gray region. The gray region is defined as, "a range of values of Δ where the statistical test will yield inconclusive results. The width of the gray region is equal to the MDD for the test" (USEPA 2002). This was identified as a potential issue in the proposed use of Form 1. However, by using Form II and following the Exhibit A flow chart, for each COPC determined by hypothesis testing to be potentially Site-related, onsite data from individual samples will be compared to the BTVs. Since this is the same procedure that was proposed for data within the gray region, discussion of inconclusive hypothesis tests will be removed from this SAP with no consequence.

Page 6, Section 2.6.1, last paragraph – Please define the conditional use of the two outlier test methods identified (i.e., specify the sample size thresholds for Dixon's vs. Rosner's outlier test).

ProUCL utilizes the Dixon's Extreme Value test for data with fewer than 25 samples and the Rosner's outlier test for data with 25 or more samples. This information will be added to Section 2.6.1.

Page 7, Section 2.6.1 – While EPA agrees with the use of ProUCL for calculations and hypothesis testing, there are underlying assumptions of the statistical approaches that should be reviewed by a statistician to ensure ProUCL recommended values are appropriate for use.

This comment is noted. Roux's statistician has been involved in the preparation and review of the SAP, and will conduct the evaluation of the data, including the use of ProUCL and evaluation of outputs to ensure recommended values are appropriate for use.

Page 9, Section 3.2 – Figure 4 does not present information on soil type in each of the background areas; therefore, it is not possible to discern if the areas are similar to site soil types.

Figures 6 will be revised to include the soil type base layer to facilitate the comparison of onsite soil types to offsite soil background reference areas. Additionally, Figures 3 and 4 will be revised to include the soil background reference areas, and Figure 5 will be revised to include the surface water/sediment background reference areas. The attached Tables 2 and 3 present soil code definitions included on Figures 3 and 4.

Page 9, Section 3.2, Soil Background Area #1 – The majority of the soil at the site has been designated as glacial till and alluvium (soil type 27-7). Background Area #1 is not in an area identified as soil type 27-7, but rather as outwash as gravelly loam (Mh). Additional discussion is needed to identify a more appropriate 27-7 background area. **Recommend this as a topic for discussion on a future project call.** The proposed Background Area #1 can be retained, however, as a suitable location for soil type Mh (i.e., this can be retained as Background Area #4). See also the comments on Figure 4.

To clarify USEPA's comment, the majority of the soil at the Site has been designated as glacial till and alluvium (27-7 ***and*** Mh). As stated in the response to the comment for Page 5, Section 2.4, although the Mh and 27-7 soil types are separated as two different soil types on Figure 4, their surface geology and soil descriptions are similar. As defined by NRCS, MH is gravelly loam, very gravelly loam; and 27-7 is very gravelly silt loam, very gravelly loamy sand, extremely gravelly sandy loam. These two soil types are made up of the same geology, are both categorized as glacial and fluvioglacial deposits (Qgr) on Figure 3, and are also the primary soil type CFAC/Roux observed during the Phase I Site Characterization. It should be noted that 27-7 soil types are not located upwind of the Site with the exception of eastern soils which are no longer in the valley, as shown on Figure 4. This location is also accessible and requires no access agreements/coordination with third party property owners.

Based on the geologic description of the soil type, CFAC/Roux believe that Background Area #1 is a suitable location for both 27-7 and Mh soil types.

Page 10, Section 3.2, Soil Background Area #2 – Inspection of Figure 4 and Figure 6 show Background Area #2, which is to be representative of fluvial deposits and riverwash (Rc), is located within a region comprised of sandy alluvium (soil type 'Ca' in Figure 4). This soil type is prevalent on the islands to the south of the Site. Also, the designated sampling area is downstream on the Flathead River from the Site and has the potential to be Site-impacted. Additional discussion is needed to identify a more appropriate background area located upstream of the Site. **Recommend this as a topic for discussion on a future project call.** See also the comments on Figure 4.

The soil descriptions generated from NRCS for Ca and Rc are provided in the table below. Similar to the response to comments above, although the Rc and Ca soil types are separated as two different soil types on Figure 4, their geologic makeup is similar. Both soil types are considered alluvial deposits and are generated from flood plains. Additionally, the results of the Phase I Site Characterization indicated that downgradient samples in the Flathead River were generally non-detect or detected at low concentrations below the EPA MCL for cyanide, fluoride, and metals. Therefore, it is not likely that the soil samples located in Background Reference Area #2, which is located approximately one-mile south of the Site boundary and over 1.5 miles from the Main Plant area, have the potential to be Site-impacted.

As presented in Figure 3, alluvial deposit soil is present upgradient of the Site along the Flathead River, but these soils are no longer in the valley and are present only in the vicinity of the Middle Fork and South Fork of the Flathead River before they meet in the Badrock Canyon. Additionally, Figure 4 shows that neither Rc or Ca are present upgradient of the Site along the river. CFAC/Roux believe Soil Background Reference Area #2 is an appropriate background reference area for fluvial deposits and riverwash soil.

USGS Surface Soil Types (Figure 3)		**NRCS Soil Types and Descriptions (Figure 4)**				
General Soil Code	**Primary Soil Type**	**Detailed Soil Code**	**Description**	**Landform**	**Parent Material**	**Typical Profile**
Qal	Alluvial Deposits	Rc	Riverwash	Flood plains	Flooded and ponded soils	Not available
Qal	Alluvial Deposits	Ca	Chamokane soils	Flood plains	Sandy alluvium	0 to 7 inches: fine sandy loam 7 to 24 inches: fine sandy loam 24 to 60 inches: gravelly sand

Page 12, Section 3.5 – Please state that the data collected from the background area for Cedar Creek will be comparable to samples collected from onsite Cedar Creek and the Cedar Creek Overflow Ditch.

A statement will be added to Section 3.5 to state that data collected from the background area for Cedar Creek will be comparable to samples collected from onsite Cedar Creek and the Cedar Creek Overflow Ditch.

Page 13, Section 3.6 – Figure 6 includes two background areas identified for Cedar Creek, but the text only discusses one (the headwaters of Cedar Creek). It is our understanding the location near Trumbell Creek was originally identified but was not retained as a suitable location following a site reconnaissance. This location should be excluded from Figure 6, but the text should be modified to discuss the outcome of the site reconnaissance.

Cedar Creek north of the Cedar Creek Reservoir and Trumbell Creek west of the Site were initially identified during preparation of the Background SAP as potential surface water background reference areas. Both areas were evaluated during reconnaissance in May 2018 and it was determined that the background reference area in the headwaters of Cedar Creek is preferred due to the size, flow, and vegetation characteristics appearing most similar to the reach of Cedar Creek that traverses the Site. Cedar Creek north of the Cedar Creek Reservoir is also accessible alongside the majority of Route 486 and on National Forest land, whereas much of Trumbell Creek is located within private residential and commercial property. The Site reconnaissance section of the draft Background SAP text (Section 4.2.1) will be revised to include a brief discussion of both background reference areas, as well as a discussion of CFAC/Roux's rationale for selecting Cedar Creek. Figure 6 will be revised to remove the Trumbell Creek background reference area.

Page 14-16, Section 4.2 – Please include citations to the appropriate standard operation procedures for sample collection in Sections 4.2.2 through 4.4.4.

Citations for the standard operating procedures will be added to the text in Sections 4.2.2 through 4.4.4.

Page 15, Section 4.2.2, 1st paragraph – Section 2.5 notes a probabilistic design will be used to identify sampling locations; however, there is no detail provided in Section 4.2 as to how this will be accomplished. If geostatistical software (e.g., ArcGIS) will be employed to identify sampling locations, these specifics should be added to Section 4.2.

Soil (and surface water and associated sediment locations) in each background reference area will be randomly generated in GIS to achieve a probabilistic sampling design. GIS utilizes a tool identified as "Create Random Points" which randomly places a specified number of points within an extent window or inside the features of a polygon, or along the length of line feature (i.e., such as reach of a stream or river).

This rationale is described in the DQOs (Section 2.3 and 2.7). Section 4.2.2 will be revised to include this rationale in the sampling approach.

Page 15, Section 4.2.2 – In the unlikely event that PID readings indicate the presence of VOCs in a background area, EPA should be notified, the location should be rejected, and a new suitable location should be selected.

A statement will be added to Section 4.2.2 to state that if the PID measurements indicate the presence of VOCs, EPA will be notified, the location will be rejected, and a new suitable location will be selected.

Pages 15 and 16, Section 4.2.3 – This section should be modified to clarify there will be ten discrete samples collected from each background area with one sample collected at each of ten different locations placed at random from within the background area.

Section 4.3.2 will be modified to clarify there will be ten discrete samples collected from each background area with one sample collected at each of ten different locations placed at random from within the background area.

Page 16, Section 4.2.3 – There is no mention of the collection of both total and dissolved fraction samples for surface water. Please add the sampling methods for each water fraction to this section.

Section 4.2.3 will be revised to mention that surface water samples are being analyzed for both total and dissolved fractions specified in Section 4.4 (total and dissolved metals and total and dissolved organic carbon). Dissolved samples will be field filtered through a 0.45 micrometer (micron) membrane filter.

Page 16, Section 4.2.3, 1st full paragraph – Please specify what the discharge data will be used for.

During the Phase I, the discharge was evaluated at multiple points along the surface water bodies in an effort to confirm the preliminary conceptual site model, that both Cedar Creek and Cedar Creek Drainage Overflow are acting as losing streams as they flow through the Site. During reconnaissance of the Cedar Creek headwaters, the creek was also observed to have a similar flow rate to Cedar Creek during reconnaissance (although was not measured with a flow meter). The discharge in the headwaters of Cedar Creek will be measured at multiple points to compare discharge between the background reference area and Cedar Creek onsite.

Page 17, Section 4.3.1 – Inclusion of QC-specific suffices in the sample identifier unblinds these samples to the laboratory. Please employ a sample numbering system for QC samples that keeps these samples blind to the laboratory.

The QC-specific suffices in the sample identifier were utilized in the sample designations throughout the Phase I and is currently being utilized in the Phase II sampling program.

As stated in Section 4.3.2, field duplicates and other QA/QC samples will also be given unique identifiers indicating the type of sample and the sample date, but the analytical laboratory will be kept "blind" as to the location of field duplicate pairs to avoid introducing any bias to the analytical process.

Page 17, Section 4.4 – Please discuss why three laboratory locations are specified and how will the field teams will know which laboratory to send the samples to.

Laboratory locations are specified based upon their ability to analyze different analytical parameters. The field teams are aware of the laboratory management procedures, and chains of custody for each laboratory will be pre-prepared to include only the appropriate analyses for each laboratory. A summary table for the analyses to be run at each laboratory is included below, and will be included in the revised Background SAP.

Soil Analysis	Laboratory	Sediment Analysis	Laboratory	Surface Water Analysis	Laboratory
SVOCs	Pittsburgh	SVOCs Low Level	Pittsburgh	SVOCs	Pittsburgh
TAL Metals	Edison	TAL Metals	Edison	Total/Dissolved TAL Metals and Hardness	Edison
Total Cyanide	Edison	Total Cyanide	Edison	Total Cyanide	Edison
Fluoride	Edison	Fluoride	Edison	Free Cyanide	Edison
TOC	Edison	TOC	Edison	Fluoride, Chloride, Sulfate, Orthophosphate	Edison
Dioxins/Furans	Sacramento	Grain Size/Sieve and Hydrometer/Bulk Density/Moisture Content	Burlington	Alkalinity	Edison

Nitrate, Nitrite as N, Ammonia	Edison
Sulfide	Edison
Total Suspended Sediment	Edison
Total Dissolved Sediment	Edison
TOC	Edison

Page 17, Section 4.4 – Please provide a cross-reference to the appropriate project SAP/QAPP that presents the laboratory method detection limits, reporting limits, and the project required limits.

The text will be revised to include a reference to the appropriate project SAP/QAPP that presents the laboratory method detection limits, reporting limits, and the project required limits.

Page 18, Section 4.4, bullets – The analysis methods listed in these bullets are inconsistent with the methods identified in Table 1 (e.g., TOC is not listed in the bullets for soil, but is included as an analysis method for soil in the table). Please ensure consistency between the text and the table.

The text will be revised to include the full list of analyses for soil, sediment, and surface water based on the list of analytes in Table 1.

Page 18, Section 4.4 – Please add a discussion of whether the method detection limits for the analytical methods specified will be adequate relative to risk-based screening levels.

A sentence will be added to indicate that MDLs will achieve both human health and ecological based screening values to the extent feasible, and will to refer to Tables 7 and 8 in the Phase II SAP (Sample Analyses and MDLs for Soil – Human Health, and Sample Analyses and MDLs for Soil – Ecological, respectively). As documented in the Phase I Data Summary Report, GW/SW Data Summary Report, and Tables 7 and 8 of the Phase II SAP, there have been and will be some analytes for which the lowest MDLs achievable by the laboratory exceed the most stringent screening criteria. The actual MDLs achieved by the laboratory will continue to be evaluated in future data summary reports and the risk assessment, and situations where MDLs exceed the most stringent screening criteria will be discussed in the uncertainty section of the risk assessment.

Page 19, References – Please add the missing citation for the Western Regional Climate Center reference (i.e., WRCC, 2018).

The reference section will be revised to include the Western Regional Climate Center reference (WRCC, 2018. Western Regional Climate Center. Prevailing Wind Direction [https://wrcc.dri.edu/Climate/comp_table_show.php?stype=wind_dir_avg]). This source presents the prevailing wind direction based on hourly data from 1992 through 2002 for the Kalispell Airport location. These data show that the prevailing wind direction for the specified period of time was south and southeast.

Figure 4 – It appears this map is restricted in the extent of the soil types that are illustrated for areas outside the Site. Please specify soil types for all areas within the map extent and expand the extent to the south and to the east. In addition, it is surprising to see transitions in soil type that are linear. For example, the transition between 27-7 and Mh/Mr on the southern portion of the site is a straight horizontal line which does not appear to follow the surficial geology presented in Figure 3. Additional

discussion is needed in the text to explain these unexpected soil type results. As appropriate, update the map with more refined soil type extents. This map will be critical to support future discussions of appropriate soil background areas.

The attached Tables 2 and 3 present soil code definitions included on Figures 3 and 4 (since they will not fit in the legend of the maps). Figure 4 will be revised to extend the soil types to the south and east. The surface soil types on Figure 4 were generated from NRCS, and thus, the rationale for the unexpected linear transition between 27-7 and Mh/Mr cannot be stated with confidence. However, surface soils are similar between 27-7 and Mh, which is consistent with how they were grouped in the Background SAP.

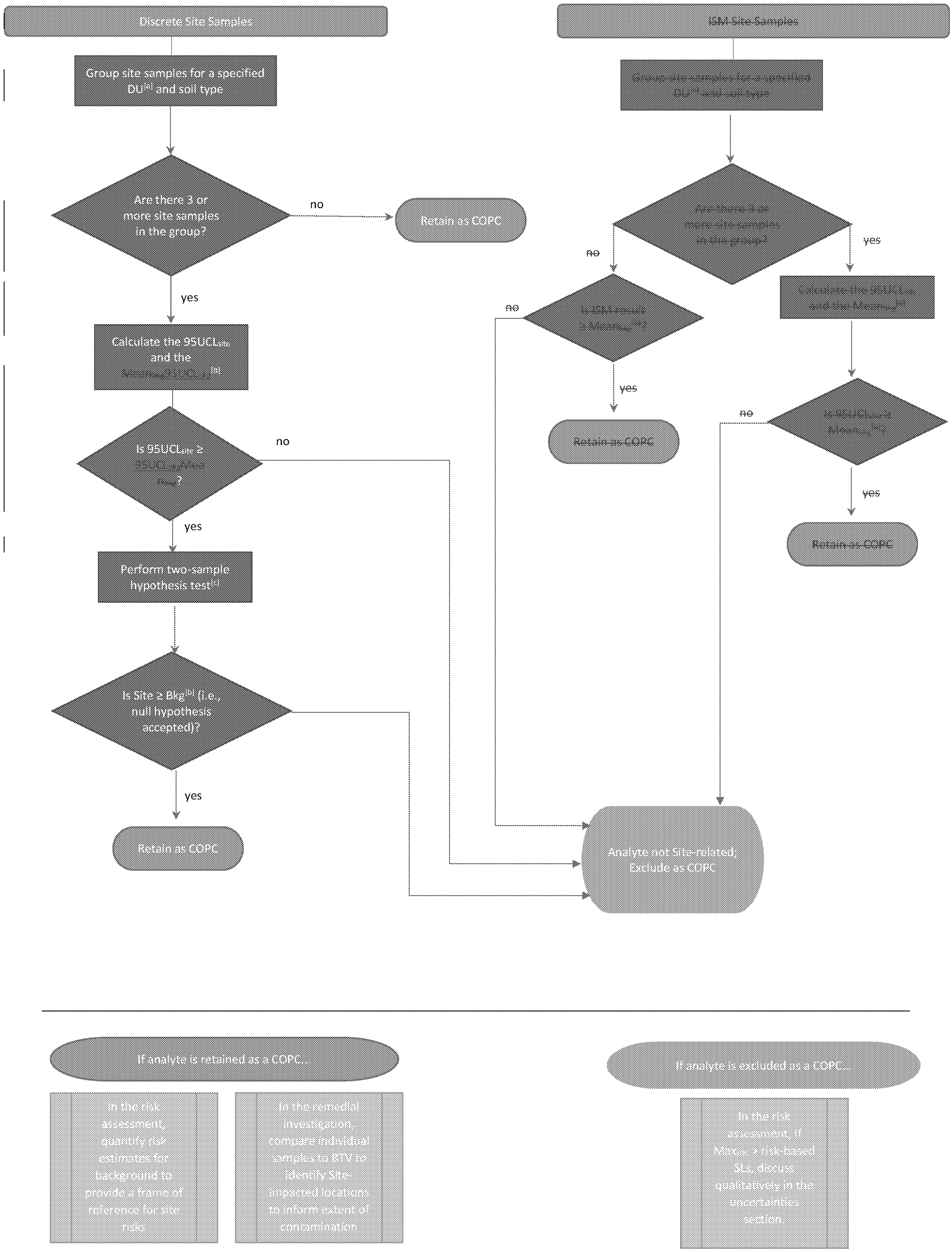
Figure 6 – Please add the background area number designations to the figure (i.e., label the locations on the map). Please use the soil map from Figure 4 as the base layer for the background areas. Please also label the surface water bodies as in Figure 5.

Figure 6 will be revised to include the background area number designations. The soil base layer from Figure 4 and the surface water body labels from Figure 5 will also be added to revised Figure 6.

Exhibit A. Illustration of Proposed Site vs. Background Comparison Approach for Soil

CFAC/Roux generally agree with the proposed Exhibit A flow chart and will incorporate the flow chart into the revised SAP. With respect to comparison of like statistics, the flow chart has been modified to be based upon comparison of the $95UCL_{site}$ and $95UCL_{background}$. While EPA's approach is more conservative, it mixes an upper confidence limit estimate of the mean with an arithmetic estimate of the mean. It would be more appropriate to make the comparison based on like statistics that consider the potential variability in the estimate of the "true" mean for site <u>and</u> background datasets. In addition, we have modified the footnote regarding outliers to be consistent with the response to comment regarding Page 5, Section 2.5. The modified flow chart is provided below in tracked changes.

Exhibit A. Illustration of Proposed Site vs. Background Comparison Approach for Soil



Notes:

[a] DU is based on exposure area for each receptor

[b] Outliers will ~~should~~ be excluded from background dataset prior to calculations/hypothesis unless there a location-specific reason identified for retaining ~~testing~~

[c] Background Test, Form 2 at α = 0.10